

UNITED STATES PATENT OFFICE.

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INTERNAL-COMBUSTION ENGINE.

1,098,539.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, JOSEPH A. WILLIAMS, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful Improvement in Internal-Combustion Engines, of which the following is a full, clear, and exact description.

This invention relates to internal combustion engines and particularly to two-cycle engines.

It is a well known fact that a two-cycle engine is an admirable prime mover and in some respects is superior to a four-cycle engine, but has the disadvantage that as compared with a four-cycle engine it has a small range in speed. It is also well known that when the speed of a two-cycle engine is decreased by closing down the throttle valve or by "throttling down" the engine, it is necessary in order that an explosive charge may be drawn into the cylinder that the needle valve be opened and that the mixture be made very rich by an excessive flow of gasoline, and even though the mixture is made as rich as possible, the engine is very unreliable and uncertain in its action, the explosions or ignitions taking place with more or less irregularity and the engine often "back-fires." Furthermore, after the engine has operated for a period at a low speed in the unsatisfactory manner above stated, and after the speed has been increased by opening the throttle valve, the operation of the engine is still unsatisfactory for a considerable time due to the fact that more or less gasoline was condensed in the crank case and ports and passages leading to the cylinder, with the result that the explosions or "hitting" is not regular, until this condensed gasoline has been carried away.

The present invention has for its main object to provide means whereby a two-cycle engine can be made more flexible in its speed range and can be made nearly as efficient at low speed as a four-cycle engine.

I accomplish the above object by providing means whereby when the engine is throttled, it is caused to hit regularly but at a less number of times in a given number of compression strokes than normally or when it is operating at a higher speed and

with the throttle valve open. In this case when the engine is throttled down, I provide means for causing each cylinder to hit or to have a charge ignited therein at each alternate compression stroke instead of at each compression stroke, and I thereby convert the engine from a two-cycle to a four-cycle engine as far as the ignition or rate of ignitions is concerned.

The above is accomplished in the embodiment of my invention here shown by causing the ignition system to be rendered inoperative or inactive at certain regularly occurring compression strokes when the engine is throttled, although an igniting arc is produced in the cylinder at each compression stroke when the engine is operating at normal or above a predetermined speed. Preferably, the ignition system is controlled automatically by the operation of the throttle lever, which in an automobile, for instance, for which my invention is particularly adapted, is carried by the steering wheel.

My invention may be further briefly summarized as consisting in certain novel combinations and arrangements of parts which will be described in the specification and set forth in the appended claims.

For a better understanding of my invention, reference is had to the accompanying drawing which is a diagrammatic representation of a two-cycle engine and one embodiment of my invention which is applied thereto.

Referring now to the drawing, 10 represents a two-cycle engine which for convenience of description and illustration is shown as provided with three cylinders A, B and C, although it is to be understood that my invention may be employed with or applied to a two-cycle engine having any number of cylinders. The cylinders are provided respectively with pistons 11 which are connected in the usual manner to the cranks of a crank shaft 12.

I employ in connection with the engine an ignition system which normally produces in each cylinder at each compression stroke an igniting arc or spark, the ignition system in this case including a high tension magneto having a low tension winding and a high tension winding 14, the former